2 Sheets—Sheet 1

M. H. FISHER.

FILE CUTTING MACHINE.

No. 4,728. Patented Aug. 29, 1846.

Fig. 1

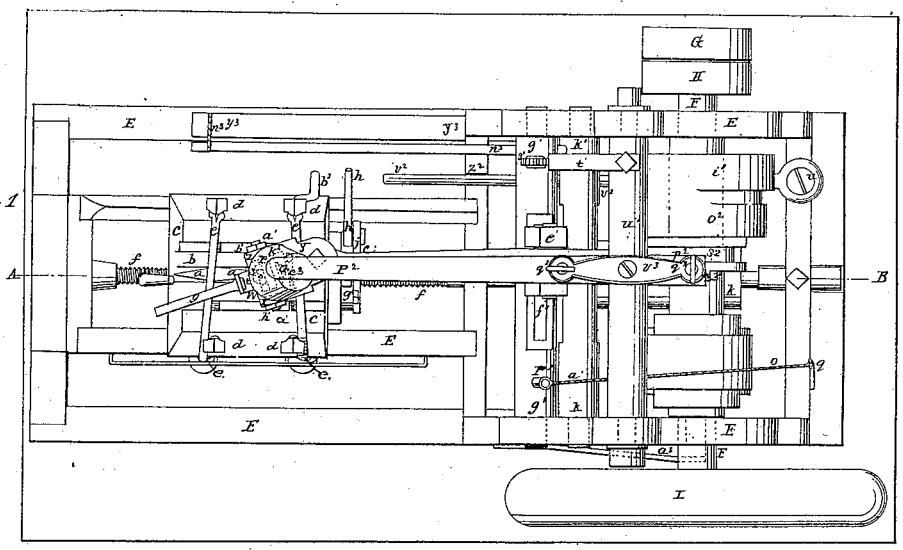
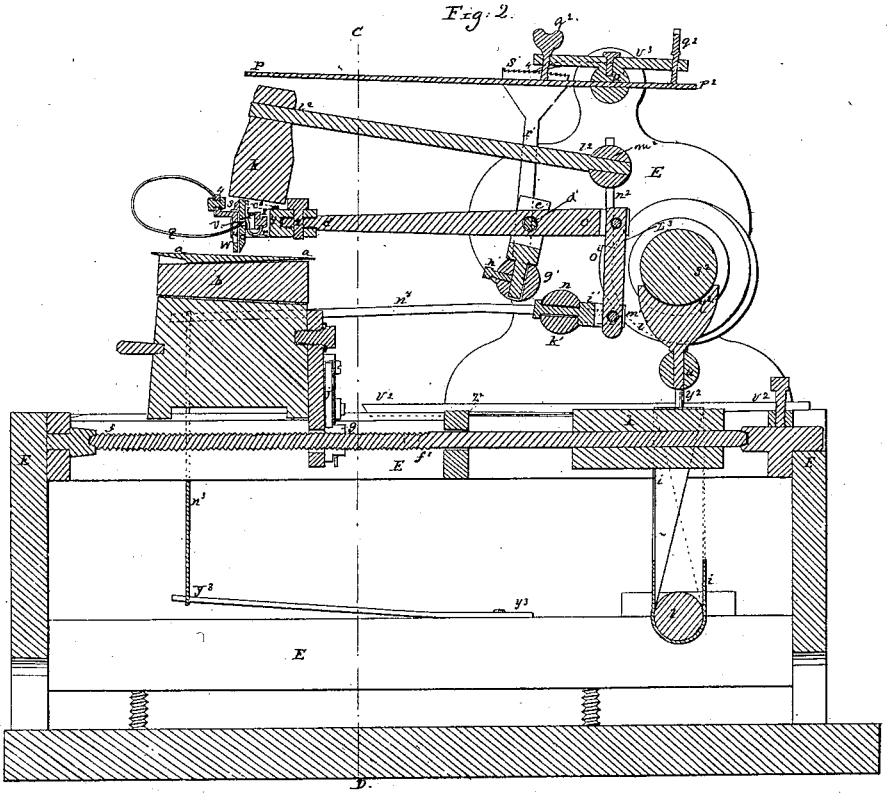


Fig. 2.



2 Sheets—Sheet 2.

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No. 4,728. **Patented Aug. 29, 1846.**

Fig. 6.

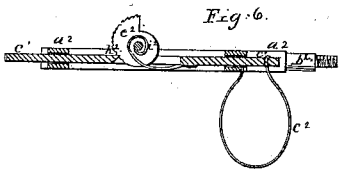


Fig. 5.

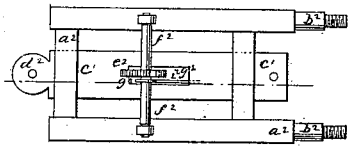


Fig. 4.

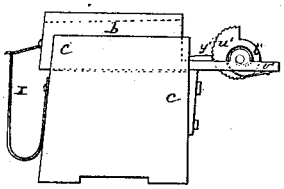


Fig. 3.

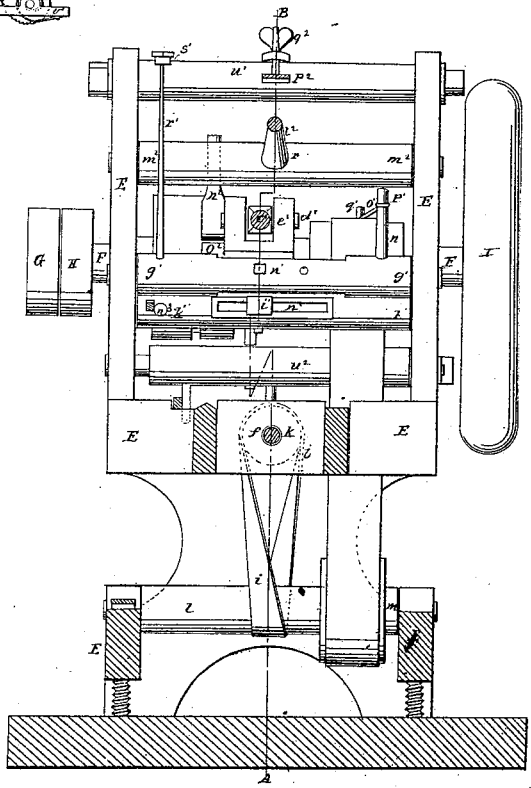
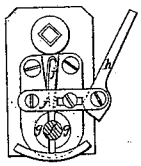


Fig. 7.



UNITED STATES PATENT OFFICE.

M. H. FISHER, OF BRIDGEWATER, MASSACHUSETTS, ASSIGNOR TO JOSEPH A. HYDE.

FILE-CUTTING MACHINERY.

Specification of Letters Patent No. 4,728, dated August 28, 1846.

To all whom it may concern:

Be it known that I, MAJOR H. FISHER, formerly of Auburn, in the county of Cayuga and State of New York, but now of Bridgewater, in the county of Plymouth and State of Massachusetts, have invented certain new and useful Improvements in Machinery for Cutting Files, and that the following description, taken in connection with the accompanying drawings hereinafter referred to, forms a full and exact specification of the same, wherein I have set forth the nature and principles of my said improvements by which they may be distinguished from others which have been devised for a similar purpose, together with such parts or combinations of parts as I claim and desire to have secured to me by Letters Patent.

In devising machinery for cutting files, a difficulty hitherto insurmountable, has been experienced which results from the variation in the hardness or density of the metal, at different points of the "blank" to be wrought upon; or to state the difficulty more practically and specifically, where the piece of metal, or "blank" is softer in some points than others, the chisel will cut deeper in such points, and as the feeding motion is regular, the chisel at its next descent will strike in the groove previously made, and merely widen said groove without forming another tooth. Serious difficulty has also been met with in accommodating the chisel edge to the "wind" (so termed) of the blank, or the imperfection of its surface. These difficulties are avoided and surmounted by my improvements, my machine being so arranged as to imitate or perform automatically, as it were, the manual process which is now in vogue, for cutting files, and which consists in placing the chisel edge in advance of a tooth which has been formed and on the smooth part of the blank, and drawing it back until the operative feels the said tooth, when the blow is immediately given with a heavy hammer, which forms the succeeding tooth and its adjacent groove. In my machine this function is effected, by so arranging the chisel, that for each groove and tooth, its cutting edge is made to reach out and slide back in a manner substantially analagous to the manual process above specified, the movements of the chisel being produced by mechanism which will be explained in the sequel.

The figures of the accompanying plate of drawings represent my improved file cutting machinery.

Figure 1, is a plan of the same. Fig. 2, is a longitudinal vertical section taken on the red line A B Figs. 1 and 3, and Fig. 3, is a transverse vertical section taken in the plane of the line C D Fig. 2. Figs. 4, 5 6, are detail views showing the various ways in which I have contemplated the application of the principle of one essential part of my improvements.

E E E E &c Figs. 1, 2 and 3 is the main framework of the machine, which supports the several operative parts and which may be made of iron or any other suitable material.

F F, Figs. 1 and 3 is the main driving shaft, from which the various moving parts derive their motion, said shaft having a fast pulley G, and loose pulley H, on one end (for the application of the motive power in the usual way), and a fly wheel I, on the other end to regulate its motions.

The plain piece of steel or "blank" *a a* as it is termed, the several faces of which are to be wrought upon, is placed upon a bed piece *b* (Figs. 1, and 2), made of some of the softer metals (for a reason which will be obvious), said bed piece having a groove oppositely made on its upper side to receive the "blank" *a a*. The metallic bed piece *b* is secured in a wide cavity or trough in the top of the feeding block *c c*, by means of the adjusting and confining screws *d*, *d*, *d*, *d*,—placed and operated as will be seen and understood by inspection of Fig. 1. The blank *a a* is held always to a firm bearing in the said groove in the bed piece *b*, by means of the weighted bands *e e*—*e e* secured each at one end to a confining screw *d*, *d* as shown in Fig. 1, and passing over the "blank" as shown in said figure. The feeding block *c c* is arranged in any proper manner so as to slide on the top of the framework E E, as shown in Figs. 1 and 2, and is drawn or moved along by the revolving endless screw *f f*, which works in the nut *g g*. The two halves of this nut *g*, *g*, are made adjustable as shown in Fig. 7, by means of a spring *j*, connecting bar *j'* and lever *h* by turning which lever up or down the nut will be thrown out of or into connection with the screw. This screw is revolved by a twisted band *i i*, passing from a drum or pulley *k* Fig. 2 near one of its ends, to and around a

transverse revolving shaft *l* Figs. 2 and 3 having bearings in the lower part of the framework; the shaft *l* is revolved by a band passing from a pulley *m* near one of its journals to and around a pulley —*n*— on the driving shaft F F.

I now come to those parts of the machine which embrace my improvements, and I shall proceed to show their distinguishing characteristics, these parts have relation to the method of sustaining and operating the chisel. In many or most of the file cutting machines which have hitherto been invented, so far as I am informed of their construction, and operation, the chisel has been held firmly, either in the hammer or striker, or in a vibrating arm under the same, and the blank has been drawn along under the edge of the chisel, by any proper and regular feed motion, so as to present it at proper points to be cut by the chisel at the successive blows of the hammer. Both of these modes of arrangement for the reason hereinbefore stated of the varying hardness of the "blank," have been found inadequate and unsuccessful in forming good or perfect files.

The chisel *o* is arranged so as to move up and down and shift its position in the rectangular slot of the chisel frame *p*. (See Figs. 1 and 2), and red lines in Fig. 1, being guided and actuated in its movements, by the long bent spring *q* in front, the vertical bent spring *r*, in its rear, the horizontal bent spring c^3, having a button d^3, fixed at its end, said button bearing against the rear face of the chisel near its top, and the wedge shaped stud or projection *s*, standing on the front face of the chisel near its top, and also the front piece or lip *w* of the chisel frame *p*.

The bent spring *q* performs one of the most essential functions, in operating the chisel, in a manner similar to the manual process herein above suggested, which function is pulling the chisel out, after each blow of the hammer, in front of a tooth previously formed preparatory to its being drawn or pressed back against the same, (by the lip, *w* as hereinafter explained) for the formation of a succeeding groove and tooth. The upper end of this spring is confined to the projection *t*, from the top of the chisel frame *p*, while the lower end passes through a slot *u* in the lip or front piece *w*, of said frame, and through a hole *v* in the chisel *o*, (where it assumes or has the shape and office of a pivot or pin x^3 for the support of said chisel), to the rear side of the same, where it is bent down in such a manner as to tend to hold the chisel against the inner face of the lip *w*, and also to press said chisel down as shown in the drawing. By this arrangement of the parts above described, it will be seen, that when the chisel-frame *p* is in the process of rising (which process will be explained in the sequel), the chisel *o* will not begin to rise until the top of the lip *w* of the frame *p* reaches the stud *s*, accordingly the lip *w* moving first, and the feed motion continuing, the front face of the chisel will have a tendency to be separated a little from the lip *w;* but when the chisel does begin to rise, and is raised out of the groove, and free of the tooth just formed, the spring *q* will pull the edge of the chisel forward, against the lip —*w*— and in front of such tooth; this will give the chisel a position in which its front face will form an angle more obtuse with the remaining plain face of the blank, than before, the wedge shaped stud *s* assisting in this operation of throwing or moving the chisel edge forward. But when the said frame *p* descends again, the chisel edge, (as will be apparent from inspection of Fig. 2), will first come in contact with the face of the blank, and as the frame *p* continues, after this, to descend its lip or front piece —*w*— will press the chisel edge back until it comes against the tooth last formed, while at the same time the spring c^3 Fig. 1, by pressing its button d^3 against the rear of the chisel *o*, will bring the front face of said chisel to a fair bearing against the inner face of the lip —*w*—, and then the chisel will be in proper position for the blow of the hammer and the formation of another tooth. The back spring *r* is intended to assist in guiding and steadying the chisel in its movements, though it might be perhaps entirely dispensed with, without materially affecting the operation of the machine.

The chisel frame *p*, is supported in the forked ends *x*, *x*, of the swivel frame *y*, as shown by red lines in Fig. 1, by means of the journals *a'*, *a'* on the sides of said chisel frame and the confining nuts *b'*—*b'* on said journals. This swivel frame turns on a proper hinge or pin *z* in the end of the vibrating lever or arm *c' c'* Figs. 2 and 3, and by turning this swivel frame round on the pin *z* to various positions, the teeth may be cut on the "blank" either straight across or in oblique lines. The vibrating lever *c' c'* or chisel arm as I shall term it, turns on a proper fulcrum or pin *d'* in the upright frame piece *e'*, which piece *e'* is fitted in an elongated slot —*f'*— cut through the rocker shaft *g' g'* Figs. 1, 2 and 3, being confined in any position in said slot by a binding screw *h'*. The rear end of the chisel arm *c' c'* is connected by means of an arm z^3 (which turns freely on a pin fitted in said end as shown in Fig. 2,), to an arm or lever *i'*, arranged in the elongated slot *n'* (shown distinctly in Fig. 3,), in the shaft *k' k'*, which I denominate the chisel actuating shaft; this arrangement of the arms z^3 and *i'* being such as to form an —L— joint as it were from the end of the

chisel arm c' c' to said actuating shaft. This shaft k' k' derives its motion from an eccentric l' on the driving shaft F F, which eccentric works against the end of the arm m' fixed on said shaft k' k' as shown by dotted lines in Fig. 2; a counteracting spring y^3 y^3 is also connected to said shaft k' k' through the medium of the lever and cord n^3—n^3, the combined operation of which spring, &c., with the eccentric l' and arm m' will be readily understood, while it will be as clearly seen, how the turning of said shaft k' k' will vibrate the chisel arm c' c', and thereby alternately lift the chisel edge from, and carry it down to, the face of the blank to be cut.

The elongated slots f'—n' above mentioned, as being formed respectively, in the shafts g' g' and k' k' allow the chisel arm c' c' to be moved, so that oblique teeth can be cut on the "blank," which will be in the reverse direction to those which can be formed while the said arm is in the position denoted in Fig. 1. The rocker shaft g' g' and chisel actuating shaft k' k' have suitable bearings in the sides of the framework E E, and the former shaft g' g' is held in any position by the following contrivance. The cord o' o' passes from an upright arm p' on said shaft, to a spring q' at the rear of the machine; this arrangement of said cord o' o' spring q' and arm p' has a tendency to pull or turn the rocker shaft g' g' backward, but this tendency is counteracted, where there is no other strain, by the ratchet sector s', on the top of the arm r', attached to said shaft g' g', the teeth of which ratchet engage with the spring pawl t', secured at one end to the cross bar or rod u'. The arms p'—r' are arranged at opposite ends of the rocker shaft g' g', and the teeth on the ratchet sector s' are so formed and connected with the pawl t' as to permit the shaft g' g', to turn forward or toward the front of the machine, when sufficient strain by reason of the resistance which the chisel meets with against a tooth (when one larger than usual has been cut on the blank) is exerted on the upright frame piece e', through the medium of the chisel arm c' c', &c., to overcome the resistance arising from the arrangement of the cord o' o', spring q' and arm p' as above specified. Now when as I have herein before suggested, the chisel comes to a soft place in the blank, it will form as stated a wider groove and a larger tooth, than where the blank is harder; and when the chisel is again raised and directed out in front of said tooth as above explained, it will, in having its cutting edge pushed back by the lip w meet the tooth previously formed sooner than ordinarily, and being kept down in contact with the blank by the long spring q, the resistance which it meets with against the tooth, draws the chisel arm c' c' and upright frame piece e' forward, (overcoming the resistance of the spring q', and turns the rocker shaft proportionally, and consequently moves the sector ratchet s', so that the pawl t' engages with another tooth of said ratchet, and thereby keeps the ratchet s' and rocker-shaft g' g' in the position thus assumed, and preserves the gain on the feed motion thus made in a manner which will be readily understood.

Another mode, in which I have contemplated the application of the principle of the above described mechanical arrangement for preserving the gain in the feed motion is as follows: I arrange the metallic bed piece b, in the cavity or trough of the feeding block c c, so that it may slide along in the same, a retarding spring x' being placed in rear of said bed piece and feeding block as shown in Fig. 4, which is a detail elevation of said parts; a frame piece v' is fastened to the front of the bed piece b, and in a slot in this frame piece, a helix-shaped ratchet w' is arranged so as to turn; there are also a coiled spring z' on the side of said ratchet w', and a pawl y' attached to the front of the feeding block c c, which pawl engages with the teeth of the ratchet w'. This helix shaped ratchet is set with its tooth, which is at the smallest distance from its axis, in connection with the pawl y', and when the chisel edge pulls against a tooth on the blank, it will pull the bed piece b and its frame piece v' forward and thereby disengage the ratchet w' from its pawl y', while at the same time the coiled spring z' will pull the ratchet w' around or down, until a tooth more remote from its axis engages with the pawl y', and thus the gain on the feed motion is preserved by a mechanical arrangement analagous to that before described.

Still another mode of effecting the result just above specified is represented in Figs. 5 and 6, the principle of operation being substantially the same as in those above described. In this case the chisel arm c' c' is arranged, so as to slide in a vibrating frame a^2 a^2 which should be secured to the rocker shaft g' g', by its ends b^2 b^2; a retarding spring c^2 operating like that above referred to at x' in Fig. 4, is placed at the rear end of the chisel arm c' c', one end of said spring being connected to the frame a^2 a^2, (it being understood that the swivel frame y, Figs. 1 and 2, with its appendages is connected to and turns on the circular head piece d^2 of the chisel arm c' c'. A helix shaped ratchet —e^2— similar to that above described is arranged on the small shaft f^2 f^2, (Fig. 5) which has suitable bearings in the frame a^2 a^2. The ratchet e^2 turns in a slot g^2 g^2 in the chisel arm c' c', the front edge of which slot is chamfered off, so as to operate as a

pawl and engage with the teeth of the ratchet c^2, as shown at h^2, Fig. 6. A coiled spring i^2 is arranged on the side of the ratchet e^2, so as to draw and turn it down when said ratchet is free to move, so that when the chisel edge, coming in contact with a tooth on the blank pulls the chisel arm c' c' forward, the gain thus made on the feed motion is preserved by the helix shaped ratchet e^2 in the same manner as has been above described and referred to in Fig. 4. There may be other ways in which the parts above described or others mechanically and dynamically equivalent to them may be arranged to effect the desired result, of making and preserving any gain made on the feed motion as herein before specified, but the principle or modus operandi will be substantially the same as in those I have described above, it being essential, that either the bed piece on which the blank is held, or the chisel arm which operates the chisel should be so arranged as to be capable of yielding when the chisel edge strains against a tooth, and that the advance or gain made by such yielding shall be retained by a ratchet and pawl or other analogous device. The blow on the top of the chisel is given by a hammer or striker k^2, arranged on the outer end of the vibrating lever l^2 l^2. The inner end of this lever is secured to the shaft m^2 m^2, Figs. 2 and 3, which has suitable bearings in the framework E E in which bearings it turns sufficiently to vibrate the lever l^2 l^2. The turning of said shaft m^2 m^2 is effected by means of its arm n^2, Figs. 2 and 3, which bears against and is operated upon, by the escapement cam o^2 on the driving shaft F F. The force of the blow by the hammer is regulated by the horizontal spring p^2 p^2, one end of which bears upon the top of the hammer k^2 while the other is fixed on the cross bar or rod u' and is projected out in rear of the same as shown in Fig. 1. The rigidity or elastic power of this spring p^2 p^2 may be increased or diminished by the screws q^2 q^2, which operate through the ends of the regulating bar v^2 (fastened to the top of the cross bar u'), in a manner which will be understood by inspection of Fig. 2.

The eccentric l' and escapement cam o^2 are arranged loosely on the driving shaft F F and may be thrown into or out of connection with a stud r^2 on said shaft so as to revolve with it or remain stationary, while the said shaft continues to turn. This result is effected as follows. A grooved collet s^2 is attached to the side of the escapement cam o^2 as shown in Fig. 1, and a projection x^2 from the side of this collet comes in contact with the stud r^2 when the said cams revolve with the shaft. A fork t^2 projecting from the shaft u^2 fits into the groove of the collet s^2, and said shaft u^2 is so arranged in bearings in the framework F F as to slide in the direction of its length. When the projection x^2 from the side of the collet s^2 is in connection with the stud r^2, it is kept so by the lever v^2 v^2, which has a fulcrum at w^2 at the rear of the machine and presses against the pin y^2 on the underside of the shaft u^2, the front end of said lever in this case being confined in a notch in the framework at z^2. By disengaging this end of the lever from this notch, a spring a^3 bearing on the outside of one of the journals of the shaft u^2 as shown in Fig. 1, will press it longitudinally, and by the connection of parts above explained, disengage the projection x^2 from the stud r^2, and allow the driving shaft to revolve while the cams on it remain stationary. The arrangement of the above described parts for gearing and ungearing is such, that when the teeth are raised on the blank throughout the length of one of its faces, the whole operative machinery will be made to cease to work by means of the stud b^3 on one side of the feeding block c c, which stud, at the stage of the process just mentioned, comes in contact with the beveled end of the lever v^2 v^2 and throws said lever out of its notch at z^3, and thereby allows the spring a^3 to disengage the eccentric l' and cam o^2 from the driving shaft, while at the same time the upper side of said lever v^2 v^2, presses on the underside of the lever h, raises said lever and throws the nut g g out of connection with the screw f f. The feeding block —c c— may then be drawn back, another face of the blank turned up and the machinery be set by hand for renewed operation.

The arrangement of the chisel o so that it may turn freely as herein before explained or hanging it upon the pivot end x^3 of the spring q, causes the edge of said chisel when it comes in contact with the face of the blank to be adjusted with reference to the imperfection of said face or to be accommodated to the wind of the same, such faces being usually not perfectly true. This result cannot be attained where the chisel is firmly held, either in the striker or in an arm under the same, and accordingly in machines of such construction the teeth on the blank are not made uniform.

It will be apparent to any mechanic conversant with machinery of this description, that springs of a different form from those above described, and springs somewhat varied from the positions and adjustments above set forth, and in some instances weights in lieu of some of the springs, may be used to effect the same results with those above described, and still the principle and combined action be substantially the same.

Having thus described my improved file cutting machinery I shall state my claims as follows:

What I claim as my invention, and desire to have secured to me by Letters Patent is—

1. The springs q and c^3 and lip w combined, (whether used with or without the auxiliary stud s) for actuating, guiding, and regulating the movements of the chisel as above described, and also any mechanical contrivances varying therefrom but substantially the same and combined substantially in the same manner for the same purpose.

2. Gaining and retaining the gain upon the feed motion substantially in the manner or upon the principles herein-above set forth.

In testimony that the foregoing is a true description of my said improvements I have hereto set my signature this twenty ninth day of April in the year eighteen hundred and forty six.

MAJOR H. FISHER.

Witnesses:

EZRA LINCOLN, Jr.,

LUTHUR BRIGGS, Jr.