(No Model.) 2 Sheets—Sheet 1.

J. HOWENSTINE.

STAPLE FORMING AND SETTING MACHINE.

No. 456,415. Patented July 21, 1891.

Fig 1

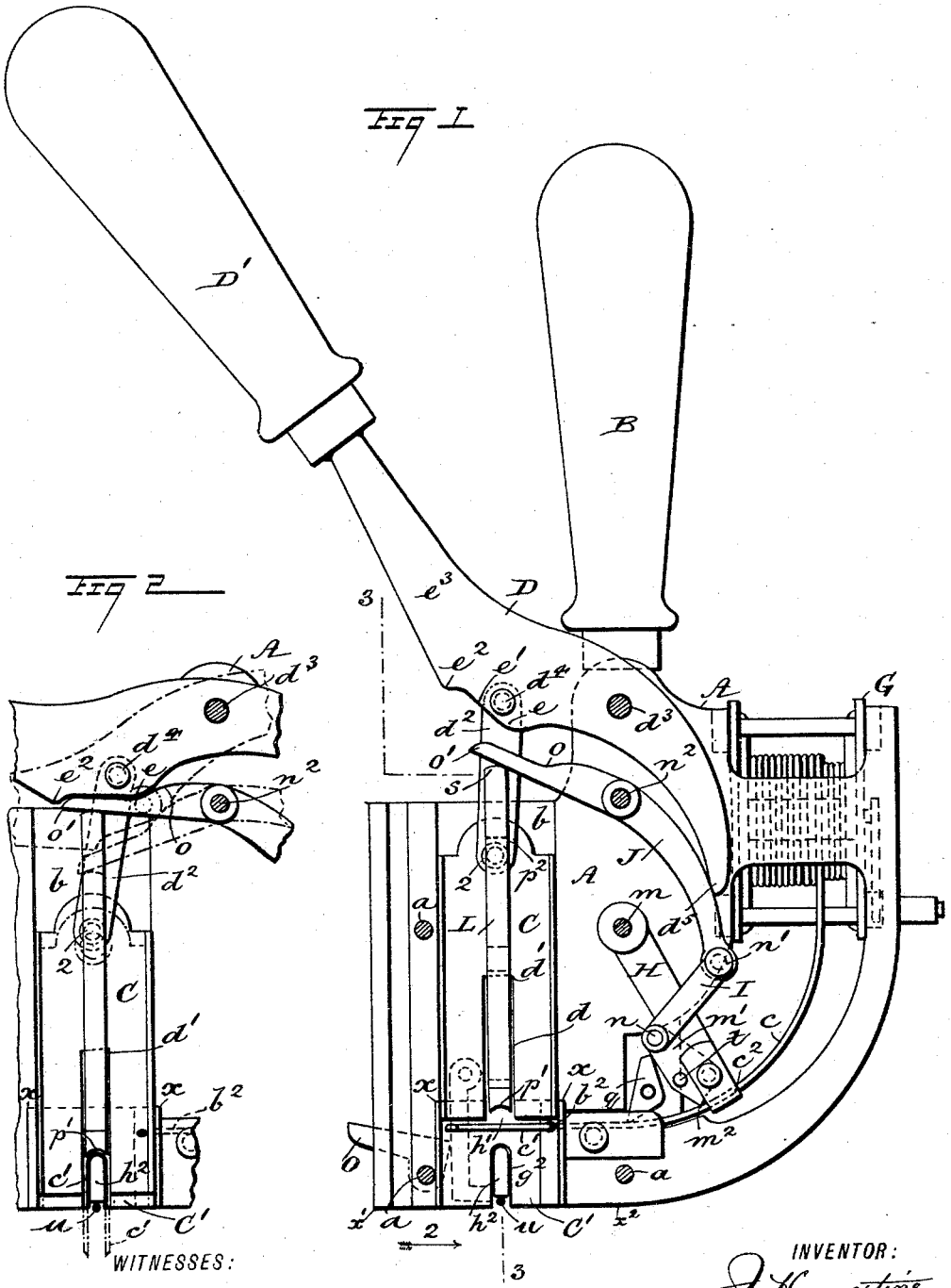

Fig 2

(No Model.) 2 Sheets—Sheet 2.

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Fig. 5.

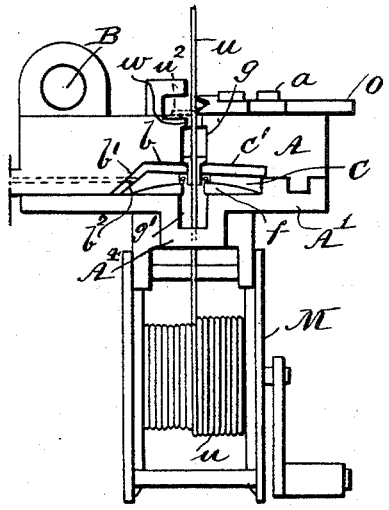


Fig. 4.

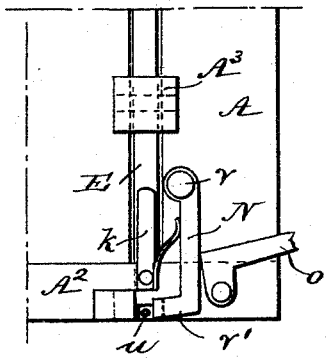
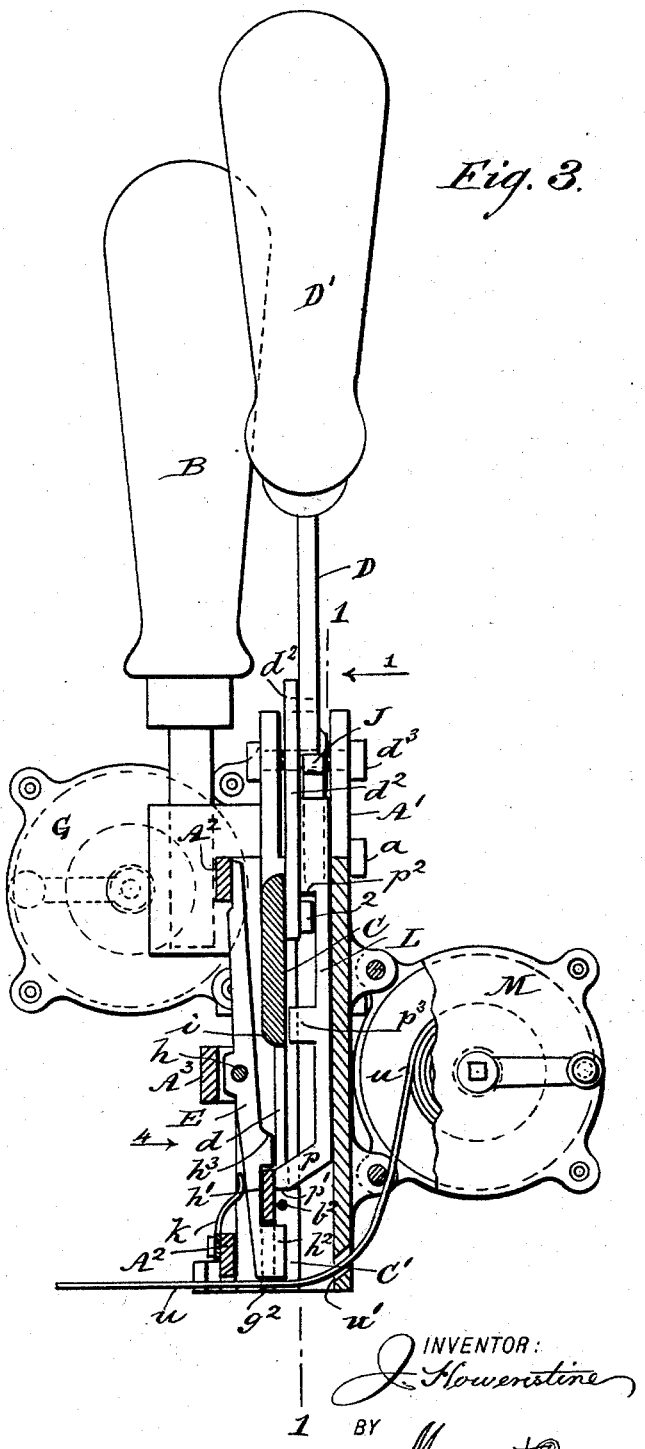


Fig. 3.



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JOHN HOWENSTINE, OF FORT WAYNE, INDIANA.

STAPLE FORMING AND SETTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 456,415, dated July 21, 1891.

Application filed September 18, 1890. Serial No. 365,351. (No model.)

To all whom it may concern:

Be it known that I, JOHN HOWENSTINE, of Fort Wayne, in the county of Allen and State of Indiana, have invented a new and useful Staple Forming and Setting Machine, of which the following is a full, clear, and exact description.

This invention relates to an improved device for the production of wire staples, and has for its object to provide a simple and practical staple forming and setting machine, which may be operated by manual or other power, and furnish means for the rapid formation of staples from a coil of wire, and the insertion of the staples as they are formed into the material that is to receive them.

A further object is to furnish a staple-forming machine with means to "set" the staples as they are successively produced in the material that is to receive them and cause the staples to embrace a stay-rod of wire which the staples are designed to fasten in place, said wire rod being carried in a coil on the staple-machine and fed from it, or otherwise supported, as may be preferred.

To these ends my invention consists in the construction and combination of parts, as is hereinafter described, and indicated in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters and figures of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the machine in section, taken on the line 1 1 in the direction indicated by the arrow 1 in Fig. 3, the parts being adjusted to cut off a staple-blank from the inserted end portion of a wire strand which has been fed from a reel on the machine. Fig. 2 is a side elevation, broken, of the working parts shown in Fig. 1, said parts being represented in the relative positions assumed by them during the formation of a staple and the projection of said staple from the machine into any material it is designed to penetrate. Fig. 3 is a transverse sectional elevation taken on the line 3 3 in Fig. 1, viewed in the direction of the arrow 2 and showing both sides of the machine connected. Fig. 4 is a broken rear side view of the device, showing the lower portion viewed in the direction of the arrow 4 in Fig. 3; and Fig. 5 is a plan view, broken, showing the working parts and their supporting-frame embraced between the points x' x^2 in Fig. 1.

The staple forming and setting machine which is the subject of the present invention, is capable of use for many purposes, and is specially well adapted for its preferred use, which is to form and insert staples through wooden or other material used in the production of packing-boxes which are stayed by the use of strengthening-rods of wire, the staples serving to retain the stiffening-rods in place.

The machine in preferred form, as represented, is designed to form staples from a coil of wire and drive them through material and over a stiffening wire rod, so as to embrace the wire rod and secure it in place on the box or other article it is intended to strengthen, as will fully appear in the description.

As shown, the staple-forming machine is adapted for use as a portable implement, which is operated by hand-power, the working parts being retained in co-operative relation to each other upon a frame which is comprised of two sections A A′, which are joined together on the line 1 1 in Fig. 3 by the transverse bolts *a*, (see Fig. 1,) the transverse fulcrum-bolts d^3, n^2, and *m* assisting to retain the parts secured together.

At a nearly central point on the upper side of the casing-section A a vertical handle B is secured, which is used to hold the implement erect and locate it at any point where a staple is to be inserted in the side of a box or other article that is to receive the staples.

Upon the inner surface of the frame-section A a vertical channel *b*, of proper depth, is formed, which extends through the frame-piece, said channel having a location forward of the handle B and near to it. The channel *b* is cut deeper toward its rear edge in an obtuse angular form, producing a short wall *b*′, which is perforated at b^2 in a plane parallel to the inner face of the frame-section A and at a right angle to the vertical direction of the wall, so that a strand of wire *c*, that will loosely fit the perforation, may be forced across the channel, as shown in Fig. 1, and strike against the channel-wall at an opposite point.

In the channel *b*, which is designed to serve

as a guideway for the vertically-reciprocating die C, said die is located, and consists of a steel plate or block which conforms in shape to that of the channel wherein it slides, so that its lower edge is adapted to engage a wire inserted through the perforation b^2 and shear it off if the die-block is forced downwardly across the perforation. To render the cutting action of the die complete, there is a thin steel die-plate C′ inserted in the channel b from its lower terminal upwardly. This die-plate, conforming to the shape of the channel, extends to the points x above the lateral perforation b^2 of the channel-wall, and is also perforated in alignment with said small aperture, so as to form a reliable coacting shearing-edge for the separation of a wire strand that is passed through it. The die-block C is longitudinally slotted from its lower end and near its transverse center to a point d', near its center of length, and is perforated near its upper terminal in alignment with said slot d for a pivotal engagement at 2 with the link d^2, which is loosely secured at its upper end d^4 to the side of a lever D, which is pivoted at d^3 to the frame-pieces A A′ and adapted to vibrate between vertical and parallel flanges on said frame-sections.

As represented in Figs. 1 and 2, the flat body of the lever D is peculiarly shaped, having a cam toe or swell formed at e. From the cam-toe e there is a straight part e' formed on the edge of the lever D, which extends to a point e^2, where another cam-toe is produced on the lower edge of the lever, and thence the shank e^3 is extended to receive a handle D′, which is secured thereon. The toes e e^2 are so relatively located with regard to the fulcrum d^3 of the lever D and the position of the die-block C that when the latter is in elevated adjustment the cam-toe e will lie above the die-block and be removed therefrom a distance defined by the length of the link d^2. From the fulcrum d^3 the lever D is curved downwardly, terminating in a finger-piece d^5, which is adapted to engage working parts that lie in a cavity formed between the frame-sections A A′, rearward of the die-block C. The inner face of the frame-section A′, opposite the channel b, is made convex, as shown at f, which contracts the space between the face of the section and the die-plate C′, which will prevent a lateral movement of a wire strand when it is inserted in the perforation b^2. The die C is shaped to fit the space thus formed, as shown in Fig. 5.

At opposite points on the frame-sections A A′ the vertical grooves g g' are formed, which align with each other and coincide with the slot d in the die-block C. The vertical groove g, that is located in the frame-section A, cuts through the back wall of the channel b continuously from the top to the lower edge of the same, the parts of section A being united by the top and bottom flanges A^2 and the lug A^3; but the groove does not entirely separate the die-plate C′, a short slot g^2 only extending from the lower edge of the die-plate upwardly a proper distance. The groove g' is formed in a rib A^4 on the frame-section A′.

In the vertical groove g a staple-former bar E is pivoted at h, near its center of length, in the lug A^3, the lower end portion of which bar extends nearly to the bottom of the frame-section A, and is cut away on the edge nearest to the die-plate C′, so as to loosely embrace the upper or unslotted portion h' of said die-plate and project a staple-forming anvil h^2 through the short slot g^2 in the die-plate C′ and beyond it a proper distance. Above the portion h' of the die-plate C′ there is an abutment-ledge h^3 produced on the staple-former bar E by the removal of material from the edge of the bar above the upper terminal of the ledge, so that an offset or rounded shoulder i, formed on the adjacent face of the die-block C, will engage the ledge h^3 and push the anvil h^2 out of the path of the die-block when it is moved down a proper distance. The die-block being cut away or made thinner below the shoulder affords room for the ledge and permits a reciprocation of the die-block.

There is a finger-spring k (see Fig. 3) secured on the exterior face of the frame-section A by its lower end. The free end of said spring, having contact with the exposed portion of the staple-former bar E, presses the same inward, so that the anvil h^2 is normally projected below a staple-blank c', which is to be cut off by the die-block C.

A reel G is provided for the support of a quantity of staple-wire which is wrapped on it, the free end portion c of said wire being extended downwardly in the recess formed between the frame-sections A A′ and passed through the looped lower end c^2 of an arm H, (see Fig. 1,) which is pivoted by its upper end at m to the adjacent walls of the frame-sections.

There is a feeding-dog m' pivoted between the doubled lower portion of the arm H, which dog has an angular toe m^2 formed on its lower end, which will bite on the wire strand c if the dog is rocked toward the die-block C.

Upon the upper end of the dog m' a connecting-bar I is pivotally attached by one end at n, the opposite end n' of said connecting-bar having a jointed attachment to the outer end of the cam-lever J, which is pivoted to the frame-sections A A′ at n^2, the inner end portion of the cam-lever having a sloping cam-shoulder o formed on its upper edge at a suitable distance from the terminal free end o' of the lever, the flat portion of the lever which lies between the end o' and cam-shoulder o being adapted to have contact with the cam-toe e on the main lever D, and be actuated thereby to rock the lever J downwardly when the main lever is similarly moved.

In the vertical groove g', that is formed in the frame-section A′, a pusher-bar L is located free to reciprocate a limited distance.

A lateral foot p is integrally formed on the lower end of the bar L, which foot projects toward the staple-former bar E and has its concave lower face p' in vertical and lateral alignment with the anvil h^2 of the former-bar E. The inner side of the rectangular pusher-bar L is cut away a proper distance near the upper end of the pusher-bar sufficiently to afford clearance for the free vertical movement of the link d^2, that is pivoted at 2 to the side of the die-block C.

At p^2 there is a shoulder formed on the inner surface of the pusher-bar L by a further reduction in the thickness of said bar, thus affording room for the circular head of the pivot-bolt 2, which loosely connects the lower end of the link d^2 to the upper end of the die-block C, the shoulder p^2 having such a relative position with regard to the lower terminal p' on the foot-piece p of the pusher-bar that the latter named will be elevated so as to carry the curved face p' above the perforation b^2 when the die-block C is fully elevated. There is a projection p^3 formed on the pusher-bar L, which bears against the die-block C and retains the pusher-bar in the groove g', the other portions of the inner side of the pusher-bar being reduced below to the foot-piece to reduce friction of the working parts.

In the operation of forming the staples successively and pushing them from the machine into material or otherwise into a proper receptacle, if the machine is used simply to produce wire staples and not set them the end portion of the wire strand c, from which staples are to be formed, is given a suitable bend so as to enter it in the portion c^2 of the arm H, as before stated, passing below the toe m^2 of the feeding-dog m', and thence below a detent-dog q, through the perforation b^2, and across the space in the die-plate C', until it strikes the opposite face of the die, as shown in Fig. 1, the wire resting where it is engaged by the dogs m' and q on a curved horizontal face or offset produced on the frame-section A. The several parts being adjusted, as represented in Fig. 1, by the elevation of the lever D, a depression of the lever will first move the die-block C downwardly a sufficient distance to shear off the staple-blank c', the shape of the die-plate and die-block sloping the ends of the staple-blank as they are cut off at b^2. The severed piece of wire c' is engaged by the lower limbs of the bifurcated die-block and pressed over the rounded top of the anvil h^2, the continuation of downward movement of the die-block bending the blank into a staple, as shown in Fig. 2 by full lines. When the staple has been formed, the depression of the lever D will have caused the cam-toe e to strike the straight portion of the cam-lever J, that lies between the rounded end o' and cam-slope o on said lever, which in turn will be depressed at this end, moving the pusher-bar L downwardly with it. The downward movement of the main lever B has carried the shoulder i on the die-block C down so that it will impinge on the ledge h^3 and rock the anvil h^2 outwardly, leaving the staple which has been completely formed free to be engaged by the curved lower face p' of the foot p on the pusher-bar L, which adjustment of parts is so timed that the anvil will recede an instant before the foot p strikes the staple c'. The die-block C is now nearing the lower end of its stroke, when the cam-toe e engages the cam-slope o on the lever J, and by reason of the change of position of the main lever B and the proximity of the sloping cam-face o to the pivot-center n^2 of the cam-lever J an acceleration of movement is given to the pusher-bar L and the completed staple is driven from the machine, as shown by dotted lines in Fig. 2. It will be apparent that the movement of the main lever B in an upward direction will cause the finger d^5 to engage the lever J and throw its outer end downward, which will in turn cause the bite of the feeding-dog m', as before mentioned, and the forward movement of the wire strand c, so that a staple-blank will be placed in the die-plate C' ready for cutting off by the return-stroke of the die-block C. When said die-block is so moved as to shear and bend the staple-blank into form, the contact of the cam-toe e with the cam-lever J will move the outer end of the latter named upwardly and release the toe m^2 of the feeding-dog m', a further movement causing a stud t on the side of the feeding-dog to impinge on the edge of the arm H and rock it upwardly a proper distance to feed another staple-blank when the lever D is elevated, the detent-dog q holding the wire strand from a rearward movement.

If the machine is to be used for the manufacture of packing or other boxes which are re-enforced by securing wire rods at spaced intervals on their outer surfaces, a reel M is secured on the side of the frame-section A', which will supply the stiffening-rods as they are required. The wire-rod material u is fed through the aperture u', and thence below the anvil h^2 in alignment with it, so that staples c' will straddle the rod u and secure it to any material the rod lies upon. At v a pendent vibrating cutter-bar N is pivoted near the lower part of the frame-section A on its outer surface, the projecting chisel-shaped end v' being adapted to cut off the end of the wire rod u and form a hook u^2 on the extremity of the wire end portion and its engagement with the ear w on the frame, whereon the hook is temporarily attached to prevent the wire from retracting until the first staple is set, when a movement of the machine to unwrap the rod material and set another staple will release the hook from the ear w. There may be a lever O pivoted on the frame of the machine that by its vibration in any convenient manner at the proper time will cut the wire rod u and form the hook u^2, as before explained.

The machine herein described is not to be considered as a hand-power machine exclusively, as it is readily converted into a stationary device that may be operated by other power than manual exertion to rapidly form and set staples or form staples only and expel them from the machine.

Having fully described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with a frame, of a cutting and forming die-block, a mating perforated die-plate on which the die-block slides, a main lever for the die-block, a movable anvil that coacts with the die-block, a staple-moving pusher-bar that sets a staple when it is formed, and a wire-feeding device, substantially as set forth.

2. The combination, with a frame composed of two sections, one section having a vertical die, and a main lever having a link connection with the die, of a mating die-plate that is perforated for staple-wire introduction and is adapted to define the length of a staple-blank, a wire-feeding mechanism which propels the staple-wire forward when the main lever is raised, a vibrating vertical staple-forming bar carrying an anvil, and a pusher-bar, substantially as set forth.

3. The combination, with two frame-sections that are adapted to receive and support working parts between them, a vertically-reciprocating die-block, a mating die-plate that the die-block slides against and that is perforated for the insertion of staple-wire, and a staple-wire-feeding device, of a pivotal vertical staple-forming bar that has an anvil projecting laterally, a vertically-moving pusher-bar, and a main lever that actuates the parts, substantially as set forth.

4. The combination, with a staple forming and setting device and mechanism to feed wire to this device, of a means to supply wire rod continuously below the staples as they are formed and expelled, and a cut-off mechanism which is adapted to sever a rod from the roll of wire and form a hook on its end, substantially as set forth.

5. The combination, with a frame comprised of two sections which are removably joined and are adapted to receive and support working parts between, a main lever having cam-toes on it and a depending finger, a wire-supplying reel for staples, and a staple-wire-feeding device which is moved by the reciprocation of the main lever, of a die-block that is connected by a link to the main lever and reciprocates with it, a staple-forming anvil moved by the die-block, and a sliding pusher-bar operated by the main-lever cams, substantially as set forth.

6. In a staple-forming machine, the combination, with the reciprocating die, the staple-forming anvil, and the operating-handle provided with a cam-toe, of the arm H, provided with the dog m', and the lever J, connected with the dog m and having the cam-surfaces $o\ o'$, substantially as set forth.

7. In a staple forming and setting machine, the combination, with the reciprocating die, the former-bar E, having the anvil h^2 and the shoulder h^3, the pusher-bar L, having the foot p and shoulders $p^2\ p^3$, and the operating-handle having the cam-surface $e\ e'\ e^2$, of the arm H, provided with the dog m', and the lever J, connected with the dog m', extending over the pusher-bar L and having the cam-surfaces $o\ o'$, substantially as set forth.

JOHN HOWENSTINE.

Witnesses:
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FRANK H. SCHUHLER.