H. M. LUCAS.

POWER PRESS.

APPLICATION FILED FEB. 6, 1919.

1,339,773.

Patented May 11, 1920.

2 SHEETS—SHEET 1.

Fig. 2.

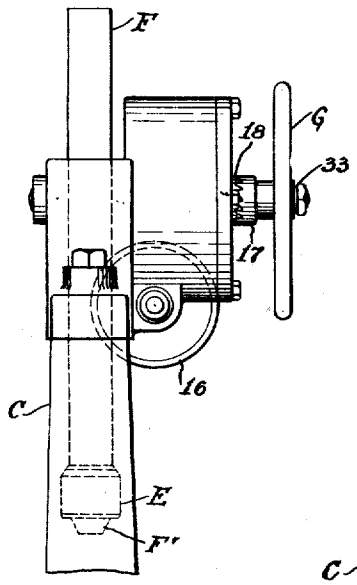


Fig. 1.

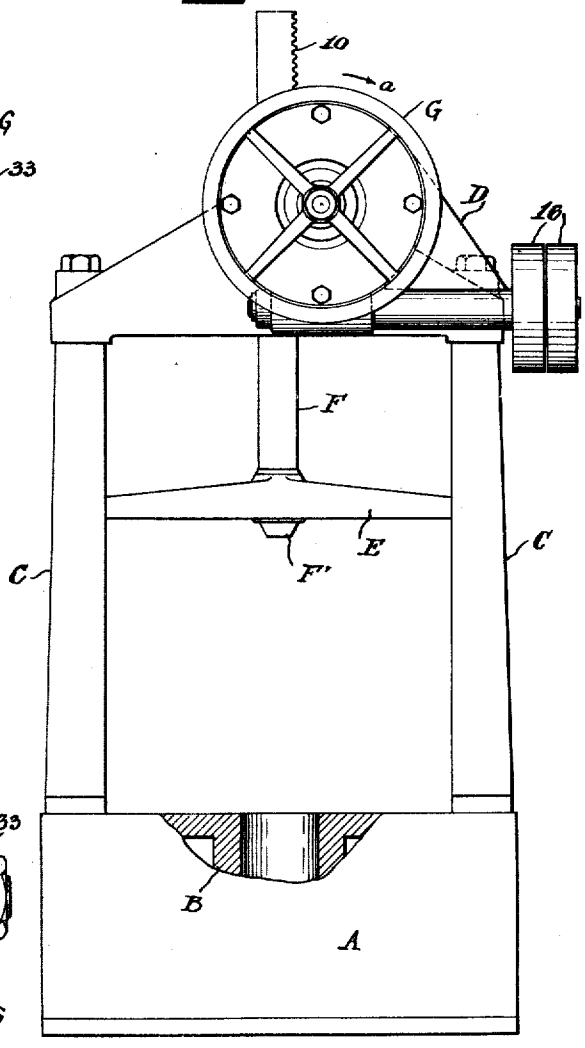
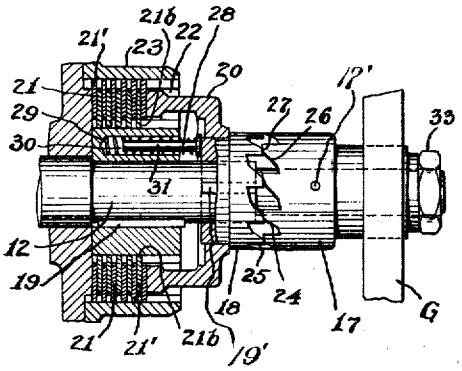


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 3.

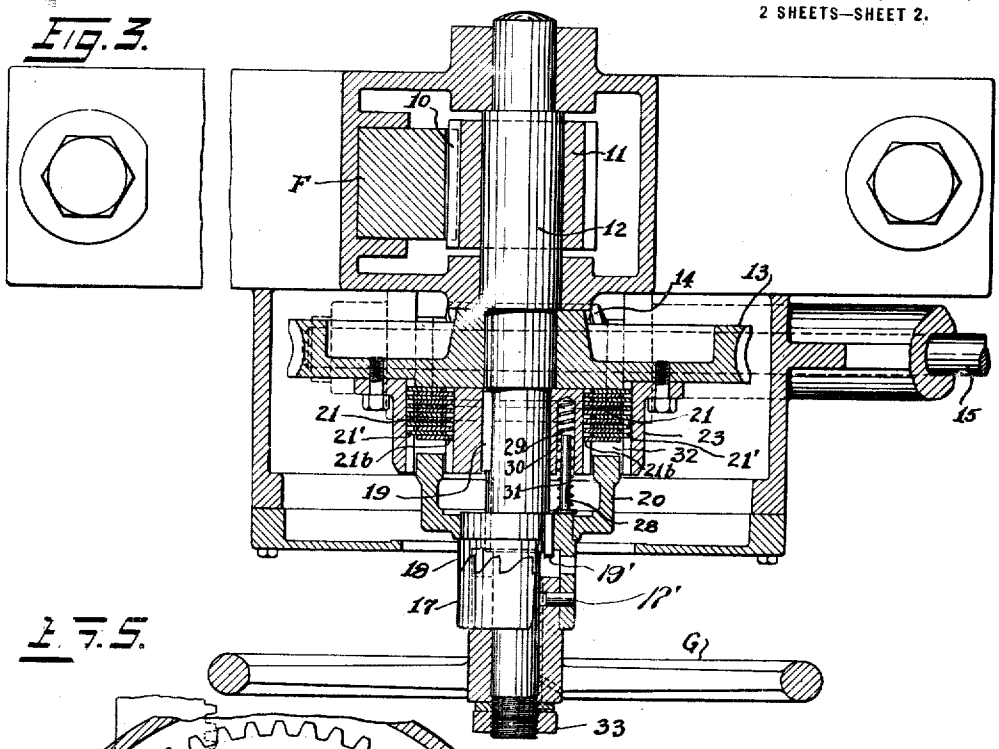
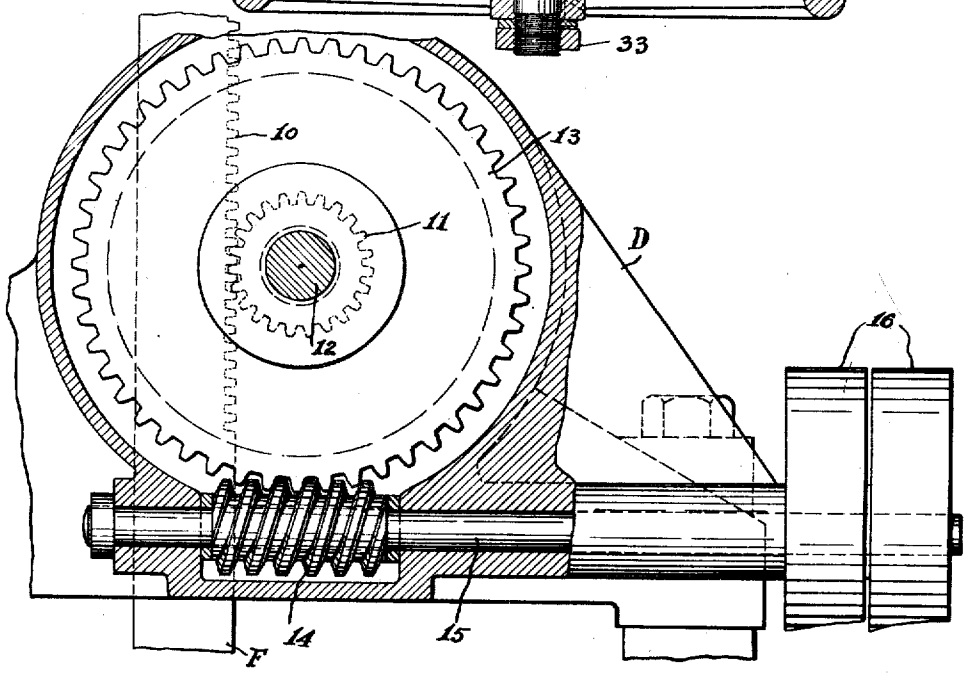


Fig. 5.



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UNITED STATES PATENT OFFICE.

HENRY M. LUCAS, OF CLEVELAND, OHIO.

POWER-PRESS.

1,339,773. Specification of Letters Patent. Patented May 11, 1920.

Application filed February 6, 1919. Serial No. 275,453.

To all whom it may concern:

Be it known that I, HENRY M. LUCAS, a citizen of the United States, residing in Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Power-Presses, of which the following is a specification.

My invention relates to power-presses generally, but is particularly applicable to those used for such purpose as forcing arbors into wheels, and operations where tight fitting parts are to be assembled, and my invention is an improvement of the power press for which Letters Patent, No. 681,063, dated August 20, 1901, were granted to me.

The leading feature of the present improvement is a hand-controlled power-driven friction-clutch mechanism so arranged that the operator of the power or forcing press may operate the ram by a quick movement either up or down, without being impeded in such operation by the power actuating apparatus.

The objects of the present improvement are to enable the operator to manipulate the machine rapidly when raising the ram away from a piece of work, and also in running the ram down from a high position until it comes into contact with the work and is ready for applying heavy pressure through the clutch mechanism and the gearing intermediate thereto and the ram, the operator having full ability to carry out the operation by control of a single means, such as a single hand wheel, thus saving the time and exertion lost in shifting from one hand to the other, as where more than one hand wheel is employed, which time in the day's work is considerable. And a further object is to provide a power or forcing press having a friction-clutch mechanism brought into play by the partial disengagement of a special jaw-clutch, comprising an outer member hand-operable, attached to the hand wheel, and an inner or intermediate member, sliding axially; and the use of abruptly or steeply inclined faces for the engaging surfaces of the teeth of the clutch members when operating the ram downward, and clutch-retracting springs, whereby the tendency of the inner or intermediate member to slide inwardly as the result of the wedging action of the inclined faces of the teeth on each other, when the hand wheel is turned, is resisted and any tendency of the inner jaw clutch member to slide inwardly, except in consequence of a disengaging force of an amount greater than the force required to move the ram downwardly, is counteracted.

I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of my power press with part of the base broken away.

Fig. 2, is a side elevation of the upper portion of my power press.

Fig. 3, is a horizontal section of the clutch mechanism of my power press.

Fig. 4, is a side elevation, partly in vertical section, of the clutch members.

Fig. 5, is a front elevation, partly in vertical section, of the worm-wheel, worm, and ram of my power press operated by the main drive.

Similar letters and numerals refer to similar parts throughout the several views.

In the drawing, A, refers to a base, preferably made of cast iron, and provided with a suitable central wedge-shaped opening B to adapt the forcing press to receive its work.

Uprights, C, C, afford support for the housing D. The ram F is guided by the cross-head E, operating in the uprights C, C. The ram F, which is provided with a suitable butt or point F′, consists, as shown by Fig. 3, of a bar of rectangular shape in cross-section, but I do not restrict myself to a ram of this particular shape. The ram F, is constructed to move upwardly to position for stroke and downwardly to its work, and is provided with rack teeth 10, on one side, which engage a gear pinion 11, Figs. 3 and 5, on the shaft 12, driven, through action of a friction clutch mechanism, by a worm-wheel, 13, engaging a worm 14, upon a shaft 15, driven by a pair of tight and loose pulleys, 16, connected to a main drive pulley.

The jaw clutch mechanism which serves for the quick motion of the ram, and also for bringing into engagement the disk friction clutch later referred to, and hence, the power mechanism, comprises with a disk housing later referred to as 23 the outer clutch member 17, having the operating hand wheel G, secured thereto the disk housing sliding on a key 19, and the inner or intermediate clutch-member 18, sliding on a key 19′, on the shaft 12, and being at-

tached to the inwardly extending disk engaging section or finger section, 20, which compresses friction disks 21, located in recesses, 22, in the disk housing 23, secured to the worm-wheel 13, the arrangement of the parts being such, referring to Figs. 3, 4 and 5, that when the outer clutch member 17 which is secured to the hand wheel G by a pin 17′, is turned in the direction of the arrow *a*, by means of the hand wheel G, the parallelly disposed faces of teeth on the jaw-clutch members, which faces are hereinafter more fully described, engage with each other and thereupon operate the primary driven shaft and thus by a direct movement through the described gear and rack the operator is enabled to drive the ram F upwardly to such an extent as may be desired within the limits of its working stroke.

The outer and inner clutch members 17 and 18 are provided respectively with engaging faces or teeth 24 and 25, Figs. 3 and 4, the faces or teeth having relatively a long and steep or abrupt incline 26, and a short and slight incline 27, the intention of the long and steep faces 26 being to accelerate the operation of lowering the ram F by direct use of the hand wheel G, the relatively steeply inclined faces 26 tending to turn the inner member 18, owing to the pressure forcing it against the hand operated or outer member 17, a force which is greater than the tendency to produce a sliding movement of the member 18. The intention of the short and slight incline 27 is to force in the inner clutch member 18, which movement and pressure is communicated to the inwardly extending disk-engaging section, bringing this into close contact with the friction-disks 21, which are hereinafter more fully described, in the housing 23, on the worm-wheel, by reason of the wedging action of the short and slight inclination, 27. To provide for resisting the tendency of the inner clutch member 18, to slide inwardly as a result of the wedging action of both the steeply and slightly inclined faces 26, and 27, of the hand operated clutch member 17, I provide the clutch-retracting spring, denoted generally by 28, Figs. 3 and 4. The clutch-retracting spring 28, consists of a helix spring 29, seated in a recess 30, in the disk-housing 23, and encircling an outwardly projectable stem 31, the tension of the spring 29, being to push said stem 31, outwardly and into contact with the adjacent base or bottom of the inwardly extending or finger section 20, of the inner clutch memeber 18. Thus it may be said that the inner clutch-member 18 when bringing the friction disk clutch into operation, takes a position due to the pressure applied to the slightly inclined faces 27, even though resisted by the outwardly acting spring 28. In practice, the spring 28 will be duplicated, usually three or more times, in order to obtain a sufficient aggregate amount of outward pressure upon the inner clutch member 18.

It is required for the proper operation of the mechanism that the resistance of said springs shall be sufficient to over-come any tendency of the inner clutch member 18, to slide inwardly as a result of the action of said steep inclines 26, before the ram meets with some resistance greater in amount than the force required to move the bare ram F downwardly. It should be noted here, that the ram of this class of power or forcing machines usually slides downward quite freely, especially after the machine has been used for some time and the surfaces have become somewhat worn. By selecting the clutch-retracting springs 28, of sufficient power for the particular service required in a machine of any given proportions, the resistance to slipping of the steeply inclined surfaces of the inner clutch member 18, on the corresponding surfaces of the clutch member 17, may be adjusted to such extent as may, in practice, be found desirable.

In Fig. 3, the inner clutch member 18 is shown forced outwardly by the clutch-retracting spring 28, so as to leave considerable space 32, for axial movement between the face of the inwardly extending section of the inner clutch member face and the outer disk, of the friction disks 21. This space 32, for axial movement is deemed desirable for preventing the sluggish releasing of the clutch members. Also the considerable amount of in and out movement provides conditions for making the steeply inclined faces 26, of the outer clutch members, through which the hand actuation downwardly, of the ram F, is accomplished, of relatively considerable length and thus provides an ample surface on which to take the pressure due to hand actuation, thereby avoiding any tendency of the surfaces to stick, even when the inclines 26, are made relatively steep.

The friction plates or disks 21—21, are arranged in two sets, one set being intermediate of the other set. One set of friction disks 21—21, is provided with projections or feathers 21′, whereby this set is made to revolve with the disk housing 23.

The other or intermediate set of friction plates or disks is provided with projections or feathers 21ᵇ, in the bores of the disks, whereby these plates or disks are made to revolve with the shaft 12. These projections or feathers are freely held in channels or ways whereby these sets of friction disks, as arranged, are permitted to close together or freely open for applying and releasing the power. This particular class of friction clutch is now so well-known that it will be

well understood by mechanics without more particular description. The piece of work having been disposed in the machine underneath the ram F, when the ram is up or in stroke position, in the usual manner (not shown), the operator first lowers the ram rapidly by hand, until it is brought down to bear properly upon the work, and this is required to be done before the friction-disks 21—21, are closed together for applying power through the shaft 12, to the ram. When the ram F, has been lowered by hand actuation, as indicated, and its end is resting on the work, the operator by turning more forcibly on the hand wheel G, turns the outer clutch member 17, in a direction causing the disengagement of the jaw clutch, thereby forcibly pushing the inner clutch member 18, inwardly, and so closing up the friction clutch disks 21—21, which then transmit power from the worm-wheel 13, to the shaft 12, and thereby downwardly operate the ram by power, which, in the present instance, is transmitted through the worm shaft 15 to the teeth of the worm wheel.

The worm-shaft 15, may be driven by a pair of tight and loose pulleys as 16, but any suitable driving mechanism may be employed for operating the worm, or, if desired, other suitable wheel driving apparatus may be used for driving the worm-wheel.

When the operator forcibly turns the outer clutch member 17, in the direction opposite to that of the arrow "a", Fig. 1, the outer clutch member 17, is prevented from sliding endwise on the shaft by a thrust-collar or nut 33, which should be adjustably fixed or fixable on said shaft for the purpose of adjusting the limit of outwardly pressing action of the slightly inclined faces 27, of the clutch members 17 and 18. When the operator turns said clutch member forwardly, that is, opposite to the direction as indicated in Fig. 1, said slightly inclined faces 27 act as powerful cams whereby forcibly to push the inner clutch member 18, against the disks and thereby close up the friction plates or disks 21—21, of the mechanism.

Having thus described my invention, it should be understood that I do not confine myself to all the details of construction, as there may be modifications thereof and variations therein without departing from the spirit of my invention or exceeding the scope of the appended claims.

I claim:

1. In a power press, in combination, a ram adapted to be moved by hand operable means to stroke position and to position for doing its work; power mechanism for moving the ram to do its work by continuous onward movement; clutch mechanism for engaging said power mechanism to move the ram to do its work; and a single means for operating said ram for movement to stroke position and to position for doing its work and for operating said clutch mechanism.

2. In a power press, in combination, a ram adapted to be moved by hand operable means to stroke position and to position for doing its work; power mechanism for moving the ram to do its work by continuous onward movement; clutch mechanism for engaging said power mechanism to move the ram to do its work and for controlling said power mechanism to move the ram by continuous onward movement during its work; and a single means for operating said ram for movement to stroke position and to position for doing its work and for operating said clutch mechanism.

3. In a power press, in combination, a ram adapted to be moved by hand operable means upwardly to stroke position and downwardly to position for doing its work; power mechanism for moving the ram to do its work by continuous downward movement; clutch mechanism for engaging said power mechanism to move the ram to do its work; and a single means for operating said ram for movement to stroke position and to position for doing its work and for operating said clutch mechanism.

4. In a power press, in combination, a ram adapted to be moved by hand operable means upwardly to stroke position and downwardly to position for doing its work; power mechanism for moving the ram to do its work by continuous downward movement; clutch mechanism for engaging said power mechanism to move the ram to do its work and for controlling said power mechanism to move the ram by continuous downward movement during its work; and a single means for operating said ram for movement to stroke position and to position for doing its work and for operating said clutch mechansm.

5. In a power press, in combination, a ram adapted to be moved by hand operable means upwardly to stroke position and downwardly to position for doing its work; power mechanism for moving the ram to do its work by continuous downward movement; clutch mechanism for engaging said power mechanism to move the ram to do its work and for controlling said power mechanism to move the ram by continuous downward movement, said clutch mechanism comprising a jaw-clutch and a friction clutch; and a single means for operating said ram for movement to stroke position and to position for doing its work and for operating said clutch mechanism.

6. In a power press, in combination, a ram adapted to be moved by hand operable means upwardly to stroke position and

downwardly to position for doing its work; power mechanism for moving the ram to do its work by continuous downward movement; clutch mechanism for engaging said power mechanism to operate the power mechanism to move the ram to do its work; and a single means for operating said ram for movement to stroke position and position for doing its work and for operating said clutch mechanism; said clutch mechanism comprising a jaw clutch and a friction clutch having friction disks; said jaw clutch comprising a rotatable outer member fixed to said single means for operation, and an inner member, the outer and inner members having respectively engaging faces with long steeply inclined surfaces and short slightly inclined surfaces and surfaces parallel to the axis of said members, the purpose of the long steeply inclined surfaces being to accelerate downward movement of the ram to position for its work, and the purpose of the short slightly inclined surfaces being to force the inner member into close engagement with the disks of said friction clutch to operate said power mechanism to move the ram during its work by continuous downward movement

7. In a power press, in combination, a ram adapted to be moved by hand operable means upwardly to stroke position and downwardly to position for doing its work; power mechanism for moving the ram to do its work by continuous downward movement; clutch mechanism for engaging said power mechanism to operate the power mechanism to move the ram to do and during its work; and a single hand-wheel for operating said ram for movement to stroke position and to position for doing its work and for operating said clutch mechanism; said clutch mechanism comprising a jaw-clutch and a friction clutch; said jaw clutch comprising a rotatable outer member fixed to said hand wheel, and an inner member, the outer and inner member having engaging faces with long steeply inclined surfaces and short slightly inclined faces, and surfaces parallel to the axis of said members, and springs for engaging said inner member to resist inward movement thereof when the long steeply inclined surfaces of the outer and inner members are in engagement.

8. In a power press, in combination, a ram adapted to be moved upwardly by hand operable means to stroke position and downwardly to position for doing its work; power mechanism for moving the ram to do its work by continuous downward movement; clutch mechanism for engaging said power mechanism to operate the power mechanism to move the ram to and during its work; and a single hand wheel for operating said ram for movement to stroke position and to position for doing its work and for operating said clutch mechanism; said clutch mechanism comprising a jaw-clutch and a friction clutch; said jaw-clutch comprising a rotatable outer member fixed to said hand wheel, and an inner member, said outer and inner members having respectively engaging faces with long steeply inclined surfaces and short slightly inclined surfaces and surfaces parallel to the axis of said members; said friction-clutch comprising a disk-housing having recesses with friction disks therein, and a finger portion or contacting-ring consisting of an inward extension of said inner member of the jaw-clutch for engaging the disks in said disk-housing.

9. In a power press, in combination, a ram having supporting and guiding means, and movable by hand operable means upwardly to stroke position and downwardly to position for doing its work, and provided with rack-teeth; a driving shaft; a gear pinion on said shaft for engaging the rack-teeth of the ram; a worm wheel turning loosely mounted on said shaft; a disk housing carried by said worm wheel having recesses with friction-disks therein; a finger-member or contacting-ring for engaging said friction-disks; an inner jaw-clutch member and a rotatable outer jaw-clutch member; said finger-portion or contacting-ring being an inward extension of the inner jaw-clutch member; said outer and inner jaw-clutch members having respectively engaging faces with long steeply inclined surfaces and short slightly inclined surfaces and surfaces parallel to the axis of said members; clutch retracting springs disposed in the disk housing for engaging the inner jaw-clutch member; a hand wheel fixed to the outer jaw-clutch member and rotatable therewith; an adjustable thrust-bearing on the outer end of the driving shaft and engaging said outer jaw-clutch member; a shaft driven by a main drive; and a worm on said shaft for engaging the before-mentioned worm wheel.

10. In a power press, in combination, a ram having supporting and guiding means, and movable by hand operable means upwardly to stroke position and downwardly to position for doing its work, and provided with rack-teeth; of the ram; a worm wheel loosely mounted on said shaft; a disk-housing carried by said worm wheel having recesses with friction disks therein; a finger-member or contacting-ring for engaging said friction disks, an inner jaw-clutch member and a rotatable outer jaw-clutch member; said finger-portion or contacting-ring being an inward extension of the inner jaw-clutch member; said outer and inner jaw-clutch members having respectively engaging faces with long steeply inclined sur-

faces and short slightly inclined surfaces, and surfaces parallel to the axes of said members; clutch retracting springs disposed in the disk-housing for engaging the inner jaw-clutch member, there being free space between said finger-portion or contacting-ring and the outer disk of the friction disks to prevent sluggish releasing of the clutch members, and to prevent the long steeply inclined surfaces of the jaw-clutch members from sticking preceding the working period of the ram; a hand-wheel fixed to the outer jaw-clutch member and rotatable therewith, an adjustable thrust bearing on the outer end of the driving shaft and engaging said outer jaw-clutch member; a shaft driven by a main drive; and a worm on said shaft for engaging the before-mentioned worm wheel.

HENRY M. LUCAS.

Witnesses:
H. A. WOOD,
G. A. YOST.