W. LLOYD.

COAL BREAKER.

APPLICATION FILED MAY 27, 1913.

1,079,301.

Patented Nov. 18, 1913.

3 SHEETS—SHEET 1.

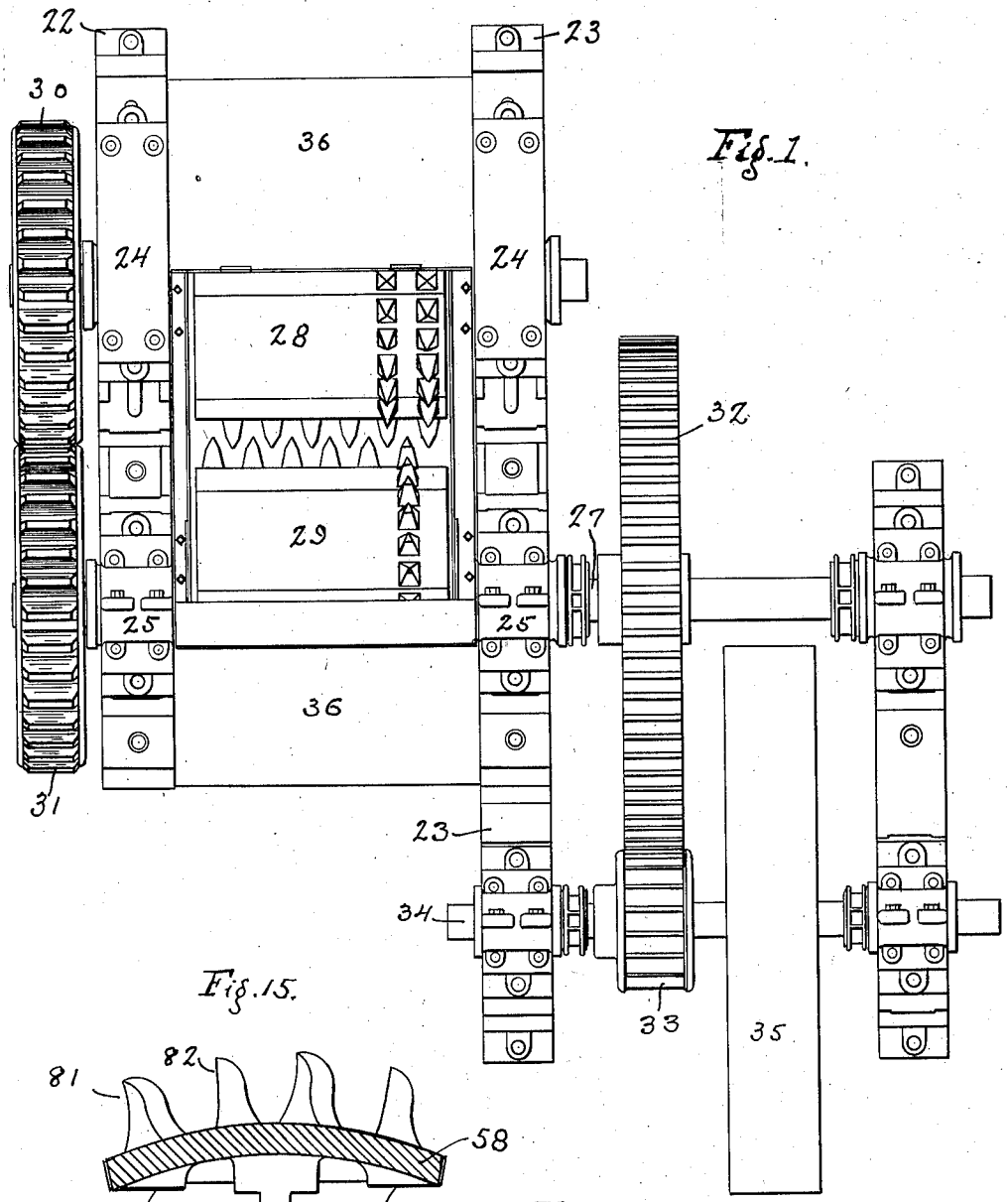
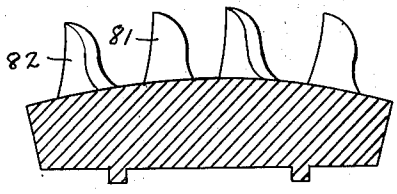


Fig. 1.

Fig. 15.

Fig. 16.



WITNESSES:

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3 SHEETS—SHEET 2.

Fig. 2.

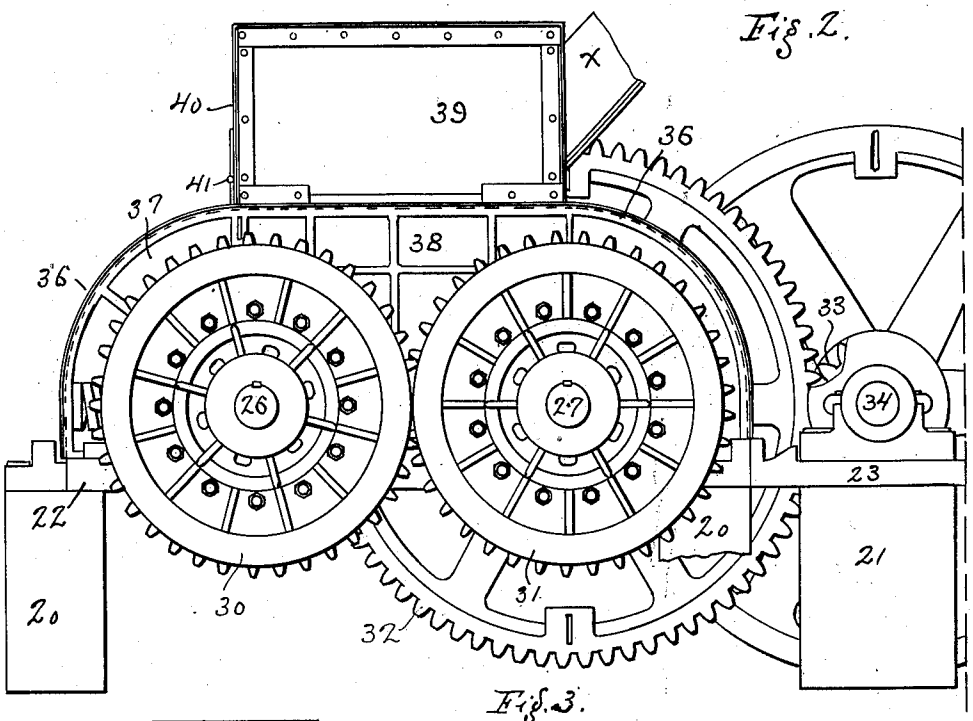


Fig. 3.

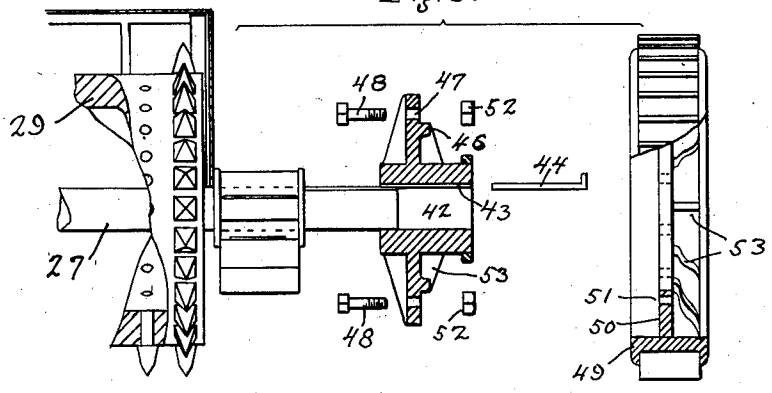


Fig. 4.

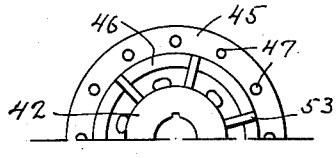
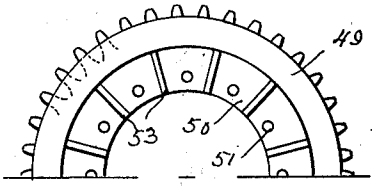


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 6.

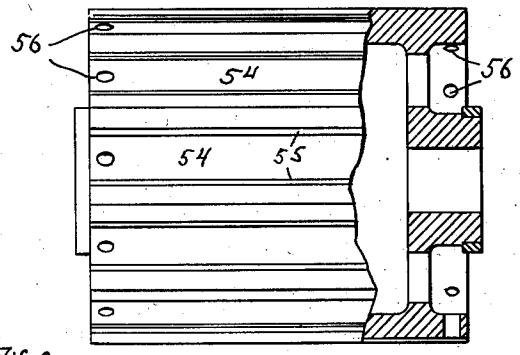


Fig. 7.

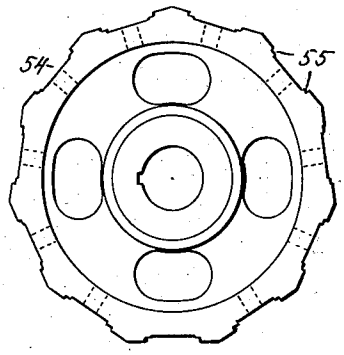


Fig. 8.

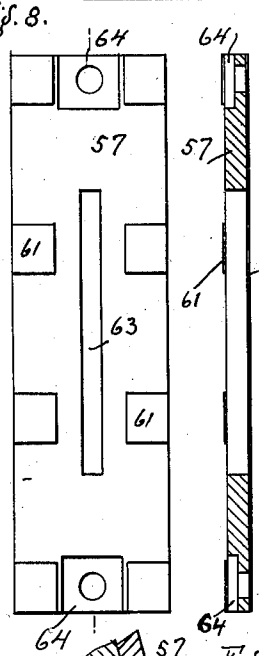


Fig. 9.

Fig. 13.

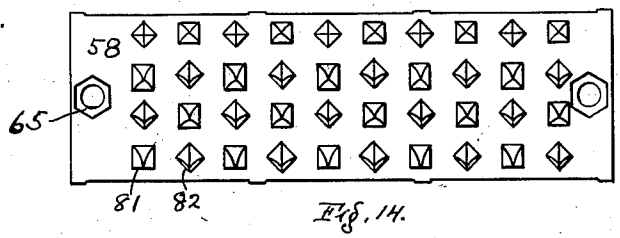


Fig. 14.

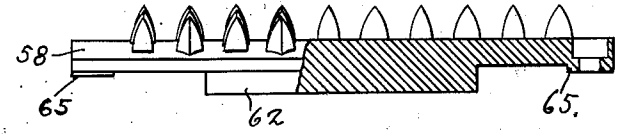


Fig. 10.

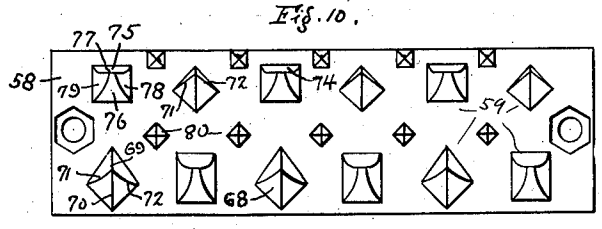


Fig. 12.

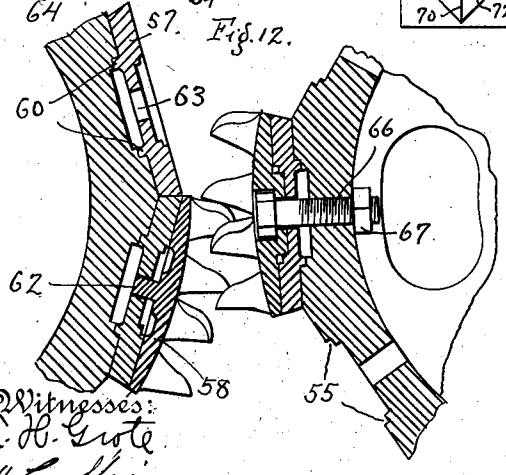
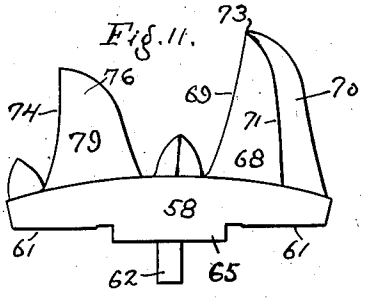


Fig. 11.



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM LLOYD, OF DRIFTON, PENNSYLVANIA.

COAL-BREAKER.

1,079,301. Specification of Letters Patent. Patented Nov. 18, 1913.

Application filed May 27, 1913. Serial No. 770,970.

To all whom it may concern:

Be it known that I, WILLIAM LLOYD, a citizen of the United States of America, and residing at Drifton, in the county of Luzerne and State of Pennsylvania, have invented a certain new and useful Improvement in Coal-Breakers, of which the following is a specification.

The present invention relates to coal breakers and the object of my invention is to improve not only the general drive of the breaking rolls, but also the particular construction of the rolls as to their gearing and the formation and arrangement of the teeth on the rolls.

In the accompanying drawing, Figure 1 is a plan of the breaker mechanism; Fig. 2 is a partial side elevation thereof; Fig. 3 is a broken elevation of one of the breaker rolls with its gear detached; Figs. 4 and 5 are partial end elevations of certain of the gear elements; Fig. 6 is a broken plan of a breaker roll showing grooves to receive breaker tooth segments; Fig. 7 is an end elevation of the same; Figs. 8 and 9 are respectively plan and side elevation of a filler piece for a roll segment; Figs. 10 and 11 are plan and end elevation respectively of a tooth segment; Fig. 12 is a cross section through portion of a pair of rolls showing the manner in which the breaker teeth segments and filler pieces are mounted thereon; Figs. 13 and 14 are plan and broken side elevation of a tooth segment showing a modified form of tooth; Fig. 15 is a transverse section through the tooth segment shown in the last two figures; and Fig. 16 is an elevation partly in section of another form of tooth segment.

The support for the present breaker mechanism may be of any well known construction. For the purpose of illustration I have shown merely diagrammatic supports 20, 21, upon which the sole plates 22, 23 of the rolls rest. Bearings 24, 25, of any suitable character for the shafts 26, 27 of the breaker rolls 28, 29, are mounted on the sole plates. The shafts 26, 27 are geared together through equalizing pinions 30, 31, while the shaft 27 is extended to receive the master gear 32, which is of large diameter. A relatively slow but powerful drive is imparted to the latter by the small pinion 33 on shaft 34 which is rotated by the belt pulley 35. It has heretofore been customary to drive the breaker rolls at a relatively high speed. I have found however that the powerful drive obtained by the gearing arrangement shown gives greatly improved results not only in the wear and tear on the machinery itself, but in the character of the product, which is obtained with much greater freedom from dust and fine sizes than when operating at the high speed heretofore customary.

To protect the workmen from flying pieces of broken coal and from dangerous proximity to the breaker rolls, I provide a housing which incloses the latter and is upwardly extended to form a sort of box through which the superposed coal hopper (not shown) discharges through chute x to the breaker rolls. This housing comprises curved end plates 36 which overlie the outer portions of the rolls, and provided with quadrant side plates 37 which inclose corresponding portions of the ends of the rolls. Spacing side plates 38 of V-shape extend between the quadrant side plates 37 thus completely inclosing the ends of the breaking roll rolls. The portions form the housing base, above which rises the box-like portion comprising stationary side plates 39 and end plate 40, the latter hinged at 41 so that it may be readily swung down to admit a workman to the space between the breaking rolls for the purpose of removing obstructions or repairing broken teeth, etc.

It is sometimes desirable to change the equalizing gears 30, 31 for the breaking rolls. Heretofore these have been keyed to their shafts and it has been necessary to draw the keys before the rolls could be removed. This has been a very difficult task after the keys have been in position for some time, especially when they have been at all deformed by the strains to which they are subjected. I now propose to divide the gears into hub and rim portions, as shown in Figs. 3, 4 and 5. The hub portion 42 is provided with a key way 43 into which the key 44 may be driven so as to practically permanently fix the hub on the shaft. A web 45 extending radially outward from the hub is provided with an annular shoulder 46 and the portion of the web extending beyond this is perforated at 47 to receive screw bolts 48. The rim portion 49 of the gear has a web 50 extending radially inward and of such diameter that it fits over the shoulder 46 of the hub. This web is perforated at 51 in register with the perforations 47 in

the hub so that the bolts 48 may be passed through both webs and the latter united by screwing up the nuts 52. Radial strengthening ribs 53 may be provided in both hub and rim. This construction permits the ready substitution of one rim gear for another, it being necessary merely to unscrew the several nuts 52 whereupon the rim 49 may be freely removed from the hub and replaced by another having a web 50 of like construction but having any desired gear tooth construction and arrangement.

It has heretofore further been the common practice to form the breaking teeth with shanks by means of which they were fastened in the perforated shell of the roll body. This old method of mounting the teeth is illustrated in Fig. 3 to make more clear the differentiation of the present construction which is shown in the remaining figures. But it is to be understood that so far as the peculiar shape and arrangement of the breaker teeth is involved in the present invention, this old method of mounting the same may be employed without departure from the invention. I prefer however to cast the teeth in longitudinal segment bars, as shown for example in Figs. 10 to 15, and mount them thus in segmental groups upon the roll body. To this end I preferably shape the shell of the roll, (see Figs. 6 and 7) to form a series of longitudinal seats 54 giving the periphery of the roll a generally polygonal outline. Each seat is preferably stepped at 55, to save machining, the ledges thus formed affording sufficient bearing surface for the segment. To enable the segments to be conveniently bolted in position, the shell of the roll body is perforated at 56 and the end web spaced in to afford room for the manipulation of the securing nuts.

The breaker teeth are preferably made of manganese steel for the sake of durability, and while a segment may be cast integral, as shown in Fig. 16, I prefer, for the sake of economy, to divide it into a filler 57 which may be of cast iron, and a face plate 58 of manganese steel with which the breaker teeth 59 are preferably integral. When the filler piece is thus formed in two parts, the filler 57 is machined not only on its inner face to form longitudinal bearing ribs 60 for the seats 55 on the body of the roll, but also at the pads 61 which form a seat engaged by the pads 61 on the face plate. A central rib 62 extending downward from the plate 58 passes through a longitudinal perforation 63 in the filler and affords an engagement between these parts. The perforated end bosses 65 on the face plate, entering the recesses 64 from which extend registering bolt perforations, further this engagement. The perforations in the face plate are preferably countersunk to receive the heads of the bolts 66 passed through the perforations 56 in the roll shell and secured by nuts 67 adjusted beneath the latter.

Another disadvantage which is common in coal breaker rolls resides in the shape of the breaker teeth, which are commonly of such contour that they present flat faces opposed to each other during the operation of the rolls, with the result that the coal lumps, instead of being split or cut by the teeth, are crushed. A large quantity of fine sizes of coal is thus produced which is of less value commercially, than the larger sizes. To obviate this difficulty, I now propose to so shape the teeth and to so arrange the same upon the rolls that during the operation of the latter there are no interstices between the teeth to which cutting edges are not presented. An example of tooth construction is illustrated in Figs. 10 and 11 in which is shown a segment adapted to break coal to the larger commercial sizes now generally employed. The teeth are of two different shapes, circumferentially and longitudinally alined, but with the shapes alternating in the rows in each direction. The tooth 68 is shaped as a four-sided tusk, arranged with an edge 69 to the front, circumferentially of the roll. This edge is preferably slightly concaved, while the opposite edge 70 is convex. The side edges 71, 72 which lie in a plane extending longitudinally of the roll, curve forward at their outer extremes to meet the edges 69 and 70 at the point 73 of the tooth which lies somewhat forward, circumferentially of the roll, of the center of the tooth at its base. The coöperating breaker tooth 74 is also four sided, but is arranged at an angle of 45° to the tooth 68 so that it presents a face 75, instead of an edge, to the front circumferentially of the roll. This face 75 is preferably concaved on substantially the same curve as the edge 69 of the tooth 68, and its opposite face 76 is convexed substantially as is the edge 70. Both faces are constricted toward their outer extremes so as to meet in a narrow cutting edge 77. The triangular sides 78, 79 slope downward and outward from this edge 77 to the sides of the faces 75 and 76. Auxiliary small teeth or teats 80 may be arranged in the interstices between the large teeth, if desired, but their presence is not essential or even desirable in some instances.

With a tooth arrangement such as shown, it is clear that a piece of coal forced down between the rear face 76 of the tooth 74 and the front edge 69 of the tooth 68 is subjected to the cleaving or cutting action of the edge 69 and is split by the latter without crushing. Similarly a piece forced down between the side 78 and the edge 71 of the

adjacent tooth longitudinally of the roll, is split by the edge 71 without crushing. The space between diagonally opposite teeth is occupied, during the operation of the breaker, by the teeth of the coöperating roll. Inasmuch as the teeth on the latter are similarly arranged, the lumps of coal are subjected to the same action between the edges of the teeth thereon. The large lumps which tend to fall into the rectangular space between the groups of four adjacent teeth on one roll are split by the point of the tooth on the opposing roll which enters this space and forced laterally between the pairs of teeth forming the rectangle just mentioned, and, as the rolls rotate, is there split by the action of the cutting edges of opposed teeth, as described.

In Figs. 13, 14 and 15 teeth of slightly different contour are shown by which the cutting or cleaving action is also secured. The teeth 81 and 82 are of smaller size than those shown in Figs. 10 and 11 and are arranged in four, instead of two, rows longitudinally of the roll, and ten, instead of six, rows circumferentially of the roll. The arrangement of the teeth alternately in the rows both longitudinally and circumferentially of the roll is the same, as is also the presentation of the cutting edge of one to the plane side of the other, so as to secure the cutting or cleaving action described. Obviously teeth shaped to effect this action may be cast independently of each other and secured upon the roll in the old manner illustrated, with the common shape of tooth, in Fig. 3. Furthermore, the particular shape illustrated may be modified in various ways while accomplishing the same end. It is to be understood that the particular tooth shape shown is merely an illustrative embodiment of my invention, as is also the particular construction of the various other features of the machine to which reference has been made.

I claim as my invention:—

1. A coal breaker having a breaking roll and teeth thereon having cutting edges and abutment faces extending between said edges, the cutting edges of each tooth being presented to abutment faces of the adjacent teeth both circumferentially and longitudinally of the roll.

2. A coal breaker having a breaking roll and teeth thereon having cutting edges and abutment faces, said teeth being arranged in rows circumferentially and longitudinally of the roll, adjacent teeth in said rows both circumferentially and longitudinally of the roll being arranged to present a cutting edge of one to an abutment face of the other.

3. A coal breaker having a breaking roll and circumferential and longitudinal rows of teeth thereon, said teeth being of two different shapes, one having a concave cutting edge and the other having a concave abutment face, said teeth being arranged alternately in said rows with their concaves facing in the direction of rotation of the roll.

4. A coal breaker having a breaking roll body, and mounted thereon a series of breaker-tooth segments, each segment comprising a filler piece adjacent the roll body and a facing segment coextensive therewith carrying the breaker teeth, in combination with engaging means on the one hand between the adjacent faces of the tooth segment and the filler piece, and on the other hand between the adjacent faces of the filler piece and the roll body to take up circumferential thrust together with means common to said tooth segment and filler piece for holding the same on the roll body.

5. A breaker roll comprising a drum of general polygonal outline, the faces of the roll periphery being centrally recessed and stepped to form seats in combination with breaker-tooth segments substantially coextensive with said roll faces and having on their lower faces longitudinal ribs adapted to engage in the seats in the roll faces to take up circumferential thrust or shearing strains during the operation of the roll, in combination with means passing through said segments and entering the roll body to retain said segments in position thereon.

6. A coal breaker having a breaker roll comprising a roll body with end webs inset from the end of the roll body, segments mounted on the latter and breaker teeth on said segments, both the segments and the portion of the roll body extending beyond the end webs of the roll being perforated in register to receive securing bolts by which the breaker tooth segments may be mounted threon.

7. A coal breaker having a breaking roll comprising a roll body, inset end webs therefor, a roll spindle fast to the latter, a hub keyed to said spindle and driving gear detachably secured to said hub.

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

WILLIAM LLOYD.

Witnesses:

WALTER ABFER,

L. H. GROTE.